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Capacitive approximation giver the invention refers to a capacitive approximation giver, are electrically connected with whom two from each other insulated electrodes held with a signal generator, from whom at least a laminar formed is, whereby the input of an amplifier with one of these electrodes is connected.

Such a approximation giver became z. B. by the DE-OS 35 09 507 known. With this previously known solution two are a common electrode exhibiting Rondensatoren provided, by which one is switched on in the feedback circuit of a differential amplifier in each case, whereby however the third electrode is potential in each case free held. In the case of this solution however significant problems result in the case of the evaluation of the obtained signals, which in addition strong from outside conditions dependent are. Thus such a solution became as distance sensor for an a park assistance for motor vehicles is hardly suitable.

Further proximity sensors are known, with which a capacitive giver plate forms an half of a capacitor and which is latter half of this capacitor direct or indirect with bulk connected. Such an arrangement, which by a large MaR at simpleness is characterised, exhibits however a number of disadvantages.

Thus an high basic capacity results against bulk in the case of these, whereby only more a relative low sensitivity is given. Further parasitic resistors, which arise as a result of contamination or the occasional influence of humidity, make measuring more difficult bottom reproducible ratios. AuBerdem are received with such arrangements also small deformations of the electrodes relative strong into the measurement.

By the DE-OS 20 44 790 already proposed became to connect the shield of an inlet cable from a capacitive giver plate to a low frequency generator with this in order to partly compensate the parasitic capacitance of the cable. But this measure does not affect only the inlet cable and has any influence on the basic capacity of the sensor plates and the fastening, so that by this measure not much gained can become.

Object of the invention is it to make with an approximation giver of the initially mentioned type the basic capacity smaller in order to reach a higher stability of the transmitter and a larger insensitiveness of the same against environmental influences.

This by the fact achieved becomes according to invention that the output of the amplifier with an intermediate electrode arranged between the connected electrodes continuous with the generator is connected, which is insulated arranged opposite the two remaining electrodes.

As a result of these max-taken a substantial reduction of the basic capacity arises opposite bulk, compared to the known solutions. In addition parasitic ohm' sche loads do not have considerable influence on the stability of the mechanism and the reproducibility of the measurement results. Further also the advantage of an only very small Emp results findlichkeit on the penetration of foreign matters, like e.g.

Dirt, between the electrodes and on smaller deformations the same.

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As particularly favourable it proved, if the intermediate electrode exhibits a surface, whose size lies between that one of the two remaining electrodes, whereby the smallest electrode is essentially central arranged to the intermediate electrode and the latter smaller electrode essentially generally towered above, whereby the three electrodes are preferably parallel and essentially concentric arranged to each other.

In this way it comes to a very favourable field distribution.

After an other feature of the invention provided can be that is arranged between with the generator and the intermediate electrode connected with the amplifier an other intermediate electrode, in their range of this insulated, reference electrode provided is, of them Surface substantial small as those the other intermediate electrode is, whereby the reference electrode with an other output of the generator is connected and the other intermediate electrode with the output of an other amplifier at the input side connected with the reference electrode is connected.

By this MaEnahmen a very large compensation of possible environmental influences is possible, since these affect both the value of the reference capacity, as well as on the measuring capacity liegeneden between bulk and the outer formed by the reference electrode and the first intermediate electrode, electrode connected with the output of the Generwators. Thus also the detected value of the measuring capacity can become corresponding corrected with a change of the value of the reference capacity.

In this connection the reference capacity can become so dimensioned, to their value the value of the measuring capacity essentially corresponds.

The generator can be thereby by two resonant circuits formed, by the measuring and/or. the reference capacity are influenceable. Since the reference capacity essentially constant remains, and/or. only due to changed environmental

influences, can from the ratio of the frequencies, with which the two resonant circuits of the generator swing, on the value of the measuring capacity closed changes become, e.g. on the distance of the corresponding electrode on a part connected with bulk depends.

Particularly a simple structure of such a approximation giver results, if the reference electrode in the plane of the other intermediate electrode is preferably arranged and by this is generally enclosed.

Such a structure loads itself light in the manner manufactures that one laminates applied conductive on an insulating substrate along the limitation of the intended reference electrode, z. B. by corrodung, remote becomes.

The invention becomes now more near explained on the basis the drawing.

Show:

Fig. 1 a schematic approximation giver according to invention with evaluation circuit,

Fig. 2 a schematic other embodiment approximation of a giver according to invention,

Fig. 3 a schematic section by the approximation giver after the Fig. 2,

Fig. 4 the schematic field distribution with a Anwen dung example of a proximity switch according to invention, and those

Fig. 5a' to f schematic various Anwendungsmög lichkeiten for an approximation giver according to invention.

The output of the generator 5, the z. B. by a resonant circuit formed to be knows, is with an electrode 1 vicinity rungsgebers of the connected. To this output of the generator is further the input amplifier 4 connected.

The generator 5 is connected at bulk and thus with the electrode 3 coupled likewise connected at bulk.

Of course also a connection could be over a corresponding line provided. Substantial one is with the fact only that the generator and the electrode 3 on the same potential are. So such a connection z could. B: also over the body of a vehicle fabricated its.

Between these two electrodes 1 and 3, which are 5 direct applied of the generator, which puts an alternating voltage signal to these electrodes, whereby this sine form or also another arbitrary signal form, e.g. Triangle form to have can, is with from guidance after form the Fig. 1 an intermediate electrode 2 arranged, which is 4 connected with the Niederimpedanz output of the amplifier. Thus also this electrode 2 with a similar signal becomes applied, as the electrode 1, i.e. that 2 signals set on the electrodes 1 and the same form and preferably also the same Amplituae have.

The output impedance of the amplifier 4 moved itself preferably in the order of magnitude of 0, 1 to 10 ohms.

With an approach of an article to the approximation giver the capacitance of the electrode 1 changes against bulk, whereby itself also the operating point of the generator 5 and thus its output signal, z. B. in desssen frequency or palpation relationship changes. These changes become in the evaluation circuit 6 detected and, depending upon the respective use, in corresponding tax or warning signals reacted.

Fig. 4 is e.g. it shown the influence the approximation giver 1, 2, 3, in a wall accommodated, or into a liquid immersed to be knows, approaching article 13 on around the NBherungsggeber of forming electric field 9.

The field 9 of the intermediate electrode 2 shields itself partly the influence one otherwise between the electrodes of 1 and 3 training electric field. It comes therefore to the formation of the electric field 10 of the electrode 1. This closes over a relative large path to the electrode 3, whereby this path becomes 13 more and more shortened by the approaching article and it comes thereby besides to distortions. This leads to a change of the capacitance of the electrode 1 against bulk.

With the embodiment after the Fig. 2 is beside the intermediate electrode 2 an other intermediate electrode 20 provided, in whose plane a reference electrode is 21 arranged, which is by a circumferential gap 22 of the electrical conductive coating of the intermediate electrode 20 of this separate. The other intermediate electrode 20 encloses the reference electrode 21.

The reference electrode 21 is with an other output of the generator 5' connected, connected to which also an other amplifier is 4', its Niederimpedanzausgang with the other intermediate electrode 20 connected is.

The generator 5 can essentially be by two resonant circuits formed, those over separate outputs with the electrodes 1, and/or. 21 and the amplifiers 4, 4' connected is.

The reference electrode 21 forms a reference capacity Ctif, which is preferably in such a manner dimensioned with the intermediate electrode 2 that her in the order of magnitude of the measuring capacity C certain by the electrode 1 and bulk $> C$ lies.

The detection of the values of the two Rapazitäten $C = f$ and Cx can take place in the manner that the ratio of the frequencies of the resonant circuits contained in the generator becomes detected, which frequencies of the mentioned capacitances become affected.

Thus affect themselves mechanical, thermal, chemical and other influences of noise, those to changes of the values of the two capacitances implement both, whereby the ratio of the frequencies of the oscillations of the two resonant circuits becomes hardly affected and therefore the result of the measurement hardly affected.

Against it an article approaches after the approximation giver the Fig. , then thereby only the measuring capacity Cx , not however the reference capacity three, changes 2 whereby also the ratio of the frequencies of the two resonant circuits of the generator 5 changes ', which becomes 6 determined in the evaluation circuit.

Arises in the case of the embodiment after the Fig. 2 a field distribution, those in the Fig. essentially corresponds to 4 represented.

After embodiment the Fig. 2 modified can become also in the manner that between the two intermediate electrodes

2 and 20 an other with bulk is, and therefore with the generator 5' connected electrode arranged, so that the reference capacity C_{ref} between the reference electrode 21 and the electrode connected arranged between the intermediate electrodes 2, 20 with bulk is formed those in the Fig. 2 not shown is. The arrangement of this other electrode connected with bulk is in particular with generators 5 of advantage, whose outputs signals with different frequencies supply, so that Interferenzerscheinungen do not affect themselves in the measurement result.

The Fig. a to f shows various application examples of approximation givers according to invention.

Thus Fig shows. a an application as distance sensor with a vehicle, whereby the electrode is 3 by the body formed and the intermediate electrode 2 and the electrode are 1 connected over electrical isolating mounting plates with the body. With an approach to an obstacle those changes Capacitance of the electrode 1 against earth, which change can become corresponding evaluated, e.g. to the activation of an optical or acoustic warning signal.

Fig. an example of an application of the approximation giver shows 5b after the Fig. 1 with elevator tür. The electrode is 3 by the metallic door frame formed, at whose the Türe course-turned front surface the intermediate electrode 2 and the electrode 1, in each case applied from each other separate over electrical isolating intermediate layers are, whereby this in accordance with electrodes the Fig. 1 connected are.

With the example 5c is after soil sensor the Fig. 1 constructed, whereby the electrode is 3 by the earth formed, in which the two other electrodes 1 and 2 embedded are.

The terminal of the electrodes to the generator and the amplifier is same, as with the Fig. 1. If a person approaches the soil sensor, then changes its capacitance, which change can become corresponding evaluated.

Fig. 5d e.g. shows a solution for an approximation giver as fuse. for images od. such. The wall forms the electrode 3 and the too protective object the electrode 1. The intermediate electrode 2 is against both insulated arranged. With approach of a person or an article the capacitance of the electrode 1 changes against bulk, which change can become corresponding evaluated.

Fig. 5e shows the use of an approximation giver after the Fig. 1 as contactless working key. This consists of an electrical conductive foil connected with bulk, one at these insulated arranged Zwischenlektrode 2, in whose plane from this insulated electrode 1 an arranged is, whereby in accordance with electrodes the Fig. 1 with the not represented generator and an amplifier connected are.